

# VIRGINIA AGRICULTURAL COUNCIL PREPROPOSAL FORM

## **Title: Microbial Safety of Virginia Fresh Market Snap Beans**

### **Justification:**

Foodborne pathogen contamination of fresh fruits and vegetables is a considerable concern to the produce industry as it can lead to recalls or even outbreaks. One foodborne pathogen of concern in fresh produce commodities is *Salmonella*. *Salmonella* is the leading cause of bacterial foodborne outbreaks in the United States (US); in addition, to accounting for approximately 1.4 million cases of illness and 500 deaths each year. As produce is often consumed raw, there is a need for development of science-based approaches to assist the produce industry in minimizing the risk of produce contamination from farm to fork.

Virginia is the sixth largest producer of fresh market snap beans in the country (US). In 2013, Virginia planted and harvested approximately 1,900 acres of snap beans intended for fresh market consumption with total cash receipts of greater than 4.8 million dollars. Thus, ensuring the continued safety and quality of snap beans intended for fresh market is vital to the economic viability and success of Virginia agriculture.

Snap beans for fresh market are highly perishable and are cooled (40-43°F) as quickly as possible after harvest. Fresh market snap beans are typically cooled using forced-air cooling, vacuum cooling, or hydrocooling. Hydrocooling is the preferred method of cooling snap beans in Virginia as the cold water cools the snap beans rapidly and reduces the snap beans from wilting or shriveling. Additionally, it is a common practice in the industry to add a sanitizer to the water during hydrocooling to ensure the highest safety and quality of snap beans intended for fresh market consumption. However, the risk of cross contamination during hydrocooling of snap beans has not been evaluated. The correct sanitation procedures and environmental awareness in snap bean packing facilities can reduce the risk of potential pathogen contamination events.

### **Objectives:**

1. To examine the growth and survival of *Salmonella* on forced air-cooled and hydro-cooled snap beans.
2. To compare the effect of different sanitizers (hypochlorous acid, peracetic acid, and chlorine dioxide) on *Salmonella* survival on surface inoculated snap beans subjected to hydrocooling.

### **Approach:**

Snap beans will be grown at the Eastern Shore AREC research fields using commercial snap bean practices. Harvested snap beans will be either part of the control or test group. Control group snap beans will be tested for the presence of *Salmonella* and standard microbial plate counts (access background microflora). Test group snap beans will be subjected to the following experiments:

- Five *Salmonella* serovars from produce-associated sources will be used in all experiment trials. *Salmonella* serovars will be made resistant to rifampicin by spontaneous mutation to allow for selection of inoculated *Salmonella* and inhibit growth of indigenous microflora from snap beans.

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- Snap beans will be inoculated with three different *Salmonella* inoculum concentrations ( $10^8$  CFU/snap bean,  $10^5$  CFU/snap bean, and  $10^2$  CFU/snap bean) to simulate three different levels of possible preharvest contamination (high, medium, and low, respectively).
- Inoculated snap beans will be subjected to either (i) forced air-cooling at 40-42°C for 90 minutes and (ii) hydrocooling water (40-42°C) containing three different sanitizers (hypochlorous acid, peracetic acid, and chlorine dioxide). Concentrations of sanitizers will be simulated based on commercial applications in the VA snap bean industry.
- Microbial populations will be enumerated on multiple days post-treatment (as the shelf life of fresh market snap beans is short).
- Experiments will be performed in triplicate (n=9).
- Appropriate statistical analyses (e.g., ANOVA, multiple comparison tests) will be performed to assess the microbial safety of fresh market snap beans, evaluate the fate of *Salmonella* during snap bean the two cooling methods; and compare and contrast the effectiveness of each sanitizer for the three levels of preharvest *Salmonella* contamination.

### **Extension Outreach:**

Findings will be disseminated through various extension related activities that are required of the PI. The PI has a 50% extension appointment that will facilitate communication of these findings to large audiences commonwealth-wide, including the Eastern Shore AREC field days, Eastern Shore Annual Agriculture Conference, as well as invited talks at vegetable grower association meetings (e.g., Northern Neck Vegetable Growers Association). Additionally, findings will be communicated by VT extension websites (e.g., <http://www.ext.vt.edu/>). It is expected that the findings of this project will help growers/packers in the development and implementation of best food safety practices in produce packinghouses and facilities that reduces the risk of contamination with human pathogens. Lastly, an advisory board of commercial snap bean growers/packers (minimum of three) will be formed to provide guidance and input during the outlined experiments.

### **Include a brief explanation of the Economic impact the project would have on Virginia agriculture.**

As stated above, Virginia ranks in the top ten US producing states for fresh market snap beans. While no outbreaks or recalls have been associated with VA fresh market snap beans, foodborne outbreaks or recalls can significantly impact the industry economically. Previous pathogen outbreaks associated with produce have been shown to financially impact a commodity industry by an approximate 33% reduction in sales. Additionally, this research project will provide science-based data on risks associated with potential pathogen contamination events in produce packinghouses in VA and aid in the development of preventive controls for such environments.

**INVESTIGATOR(S)\*** Laura K. Strawn

**DURATION (years)** one X two \_\_\_\_\_

**BUDGET (yr. one)** 20,000 (total) 20,000

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**\*One pre-proposal per PI please**

COMMODITY GROUPS	CHECK <u>ONE</u> GROUP THAT BEST DESCRIBES YOUR PROJECT
Aquaculture	
Fruit/Wine	
Livestock Dairy Poultry Hogs Beef Sheep Goats Horses	
Nursery/ Forestry	
Row Crops	
Turf/Seed	
Vegetable	X
Educational	
Miscellaneous Agriculture	